AFTER PEAK OIL: WILL OUR CITIES AND REGIONS COLLAPSE?

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Abstract
Peak oil is a new reality with the potential to undermine our cities and regions. Will it lead to a Jared Diamond type of 'collapse' as some are suggesting? How can we adapt?

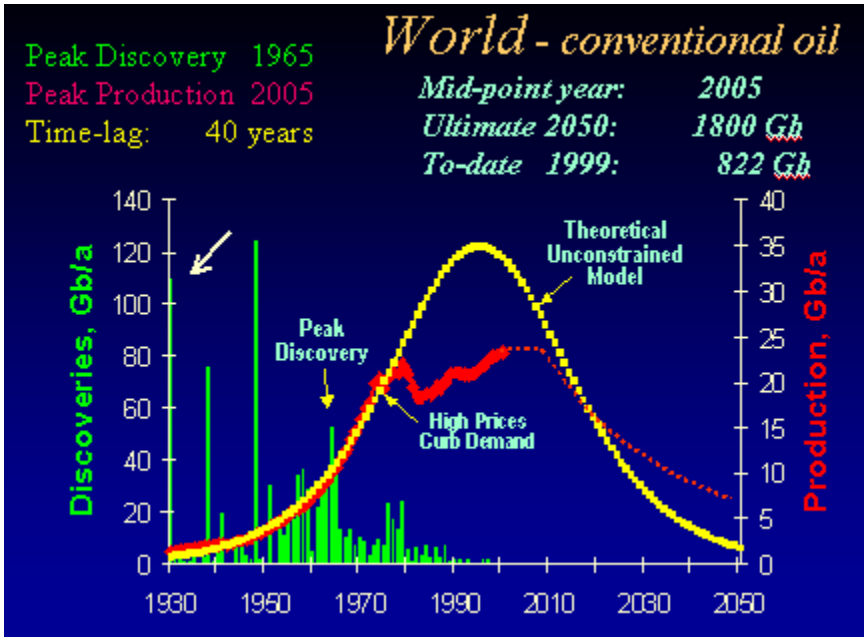
Introduction

Jared Diamond's book 'Collapse' looks at how settlements and regions in the past have collapsed due to an inability to adapt leading to an undermining of the natural resource base on which they depended. He speculates on how climate change and resource degradation are threatening our cities and regions. These are slow moving phenomena that can undermine the apparently inevitable growth of cities and increases in regional productivity – just as in former times. Yet Diamond does not examine the more recent phenomenon of peak oil which has the potential to impact on our cities and regions in a far more direct and rapid way. Indeed there is a rapidly growing apocalyptic movement associated with awareness of peak oil that sees little hope for avoiding collapse. Characteristics of the oil peak and the growing fear of its consequences will be outlined before trying to see how we might think about such a deep threat to civilization and what we should do about it.

The Peak Oil Crisis

Every oil field goes through a production cycle of increase-peak-decline. When oil fields in a region are aggregated you can tell when the area will peak and then decline. Although half of the oil remains at the peak in production, the other half of the oil is harder to extract, it becomes more and more filled with water and requires more and more energy to pump it out. Eventually as wells are abandoned the region becomes less and less important and other regions are used. National oil supplies can be examined to see how they appear in this cycle of oil depletion. After a nation peaks in its oil then a very different set of economic and political factors come into play for that country as it must look elsewhere for its oil if it is to continue growing in its use. When in 1956 M King Hubbert first suggested that the US would peak in oil production in 1970 he was greeted with derision. However it happened and the US began to import oil which led to the strengthening of OPEC and the geopolitics of oil in the last part of the 20th century. The US now imports half of its oil and it cost them US$144 billion for the first 10 months of 2005. This was an increase of 32% over the previous year because the cost of a barrel of oil is spiralling, perhaps, some say, because the world oil production peak is occurring.

Global discoveries of oil peaked in the 1960's as shown in Figure 1.



Enormous effort has gone into trying to discover more oil and to extract more from the reserves that remain. Oil reserves are now growing at a much slower rate than oil is being consumed. A peak in global oil production is therefore inevitable. There are various estimates of when the peak will occur but they cluster around the early part of this century, with a few (now mostly discredited) way out into the future. C J Campbell, an oil geophysicist who founded the Association for the Study of Peak Oil, says that conventional oil peaked in 2004 and all oil liquids will peak in 2010. He says:

> *'The real point is not so much the exact date of peak but the statement that the First Half of the Oil Age, which was characterized by growing production, is about to be followed by the Second Half when oil production is set to decline along with all that depends upon it. On that at least we can stand firm. '*

The ABC Catalyst television show on peak oil (November,'05) reported an Australian oil company CEO who had asked the attendees at last year's Australian Petroleum Production and Exploration Association whether they thought the global oil production peak had already occurred - half had raised their hands.

Oil companies tend to give statistics on oil availability based on how long it will last at present rates of consumption. This tends to be around 30 to 40 years, but this is misleading as oil will not keep being produced at the same rate then suddenly stop. The second half of the production cycle is harder so there is physically less and less available each year once the peak is passed. In an economy used to increases each year this is a significant difference. The peak is the critical change point.

Despite attempts by OPEC in recent times to increase production, global oil seems to be at its full capacity. This level may hold for a few years then it will inevitably fall. This is happening just as China and India have entered the global oil market in a big way – China is now the world's second biggest consumer of oil. Supply to consumers in the

west will be constrained by physical capacity and by the new players in the global market. The reality is the Golden Age of oil is over.

Why has there been a rush of awareness and concern around this issue? A number of geophysicists and industry insiders have 'blown the whistle' with their misgivings, especially on how real the oil reserves actually are. Most oil reserves are in the hands of OPEC but these analysts were concerned about the reality of some Middle Eastern reserves (especially Saudi Arabia); they were able to demonstrate that 'phantom reserves' had been created in the past decades in order to create higher OPEC quotas on production. Quotas on production were a license to make money in a world desperate for oil. Re-evaluating the known geophysical data by people like Campbell, shows we are close to the peak, if not already there, and that oil will soon be subject to major physical shortages.

My involvement in this issue goes back to the first oil crisis in 1973 when I was a post doctoral student at Stanford University in California. The OPEC-induced physical reductions in supply caused real panic in the community as people stayed at home or queued for hours for diminishing supplies. M King Hubbert, by then over 80, gloated to a rapidly convened energy course at Stanford that he had predicted this crisis in 1956. However, he said, though the crisis in 1973 seemed hard the real test would be in the early part of the 21st century when global oil would peak. This would be, he believed, the biggest challenge our oil-based civilization had ever faced.

The response from most economists is that supply and demand will create the necessary change; 'the stone age didn't end with a shortage of stones' is a statement frequently heard when oil depletion is debated. BP Exploration Manager Richard Miller, in response to this statement, said that:

> *"This is the classical economist's view: something will turn up, when the price of oil is high enough, because something always does. But there isn't anything conceivable that could replace conventional oil, in the same quantities or energy densities, at any meaningful price. We can't mine the oil sands in sufficient quantity because there isn't enough water to process them. We can't grow bio-fuels because there would be no land left to grow food. Solar, hydro, wind, and geothermal don't yield enough energy, hydrogen (from water) takes more energy to make than it can yield, and nuclear fission and fusion are presently off most political agendas... When oil gets too expensive, surviving Americans will still obtain energy from alternative sources, but in much smaller amounts and at much higher prices.*

There are many conferences on this topic now, especially by the Association for Peak Oil. A key presenter at their International Oil Depletion Workshop in 2002 was Matthew Simmons, a prominent energy-sector investment banker from Houston and author of 'Twilight in the Desert' which shows that Saudi Arabia's reserves are not what the world had been relying on. Simmons said:

> *"I have studied the depletion issue intensely for too long now to have any remaining doubts as to the severity of the issue. But I am still amazed at the limited knowledge*

that exists, even in the U.S. or within our major oil and gas company's senior management about this topic and its dire consequences".

"Most serious scientists worry that the world oil supplies will peak [and then decline]. Peaking of oil cannot be predicted accurately, but the event will occur. Peaking turns out to only be clear through a 'rear-view mirror'. By then, an alternative or solution is too late. My analysis leads me to worry that peaking is at hand, not years away. If I am right, the unforeseen consequences are devastating. The facts are too serious to ignore."

A 2005 report prepared for the US Department of Energy by Hirsch et al confirmed such warnings. Entitled "The Mitigation of the Peaking of World Oil Production," the report observed:

> *... the world has never faced a problem like this. Without massive mitigation more than a decade before the fact, the problem will be pervasive and will not be temporary. Previous energy transitions were gradual and evolutionary. Oil peaking will be abrupt and revolutionary.'*

I have spent the past thirty years trying to create awareness on this issue and to help prepare our cities and regions for the new constraint. When the ABC Catalyst show dramatized the issue recently it was the first time I had seen such a media story in Australia apart from a few newspaper articles in Perth (many of my colleagues in other Australian cities say they have never been able to get into Sydney or Melbourne papers). In response to the show I received a number of emails including one from a man who said that he was amazed that as an educated person he had never been exposed to this issue. He assumed it was a 'beat up' so followed it through on the web and found a plethora of material that convinced him we were correct.

Although there is growing awareness of the problem, there is also widespread ignorance and denial, even by people who should know better. Why? Obviously oil companies don't want to talk up looming shortages due to the impact on their share price, though 'phantom reserves' can lead to some real share price issues. Governments can take their share of responsibility for not wanting to jump into this issue as well; it is not in their interest to disturb people. But most of all, the community at large, I feel, is not willing to think about the implications. The Guardian (2nd December 2003) in an article called "Bottom of the barrel – The world is running out of oil - so why do politicians refuse to talk about it?" concluded:

> *"Every generation has its taboo, and ours is this: that the resource upon which our lives have been built is running out. We don't talk about it because we cannot imagine it. This is a civilization in denial."*

This is an 'elephant in the bedroom' issue. We prefer to go on with life as though it weren't there. It challenges every aspect of life as we have spent the past 50 or more years building our cities and regions around the free availability of cheap oil.

City Growth and Regional Productivity

Cities have grown strongly in the age of cheap oil. Cities are presently growing globally at 2.3% per year and rural areas at 0.1% which means people are still leaving the country for the city. Today around half of humanity live in cities. This process has been happening since the Neolithic revolution when agriculture enabled food surpluses to create a division of labour in settlements. The unlocking of human ingenuity to work on technology, trade and urban culture, has created ever expanding opportunities in cities. This accelerated with the industrial revolution and more recently globalization of the economy. All Australian cities participate in a global economy which has been built around the availability of cheap oil.

There are no models we can easily use to understand how cities will manage in the age of reduced oil availability. All Australian cities have recently had strategic planning studies done for the next 30 years of development. Although the studies have recognized that there is a need to reduce automobile dependence and save on oil, they have not intervened in any radical way to stop oil-consuming behaviours, and they have assumed continuing growth in population and jobs – growth which peak oil could throw into doubt. What will happen to Australian cities as oil peaks?

In Australian regional areas also, the population has been declining but not regional economic productivity based on mining and agriculture. Both activities have been growing based on cheap oil. Both have a large component of diesel for transport, machinery and processing. What will happen to regional productivity in the age of declining oil availability?

Scenarios from the 'Peakers'

These questions are beginning to be answered by the 'Peakers', as they are known, with an increasingly apocalyptic tinge. They see that our cities and regions will find the transition to a post oil economy very difficult, indeed they see the potential for full scale collapse.

Lankshear and Cameron suggest that:

> *'The cost of everything that depends on oil will rise. Airlines will become unaffordable to the average citizen and will go bankrupt as a result. Once the airlines stop flying the world's largest employer, international tourism will take a severe economic hit. Smaller nations dependent on tourism will become bankrupt. The flow-on effects of oil prices skyrocketing out of control will throw us into the Greater Depression.'*

Yet this is one of the milder scenarios suggested. A rash of websites set out some of the worst nightmares imaginable (see for example lifeafterthecrash.net; dieoff.com;). A Republican Senator after discovering peak oil said 'Civilization as we know it will end soon.'

As Lankshear and Cameron suggest:

> *'Peak oil has already become a magnet for post-apocalyptic survivalists who are convinced that western society is on the brink of collapse, and have stocked up tinned food and ammunition for that coming day.'*

Like most new movements there is a good deal of overstatement in the rhetoric of 'peakers'. They emphasize the problem and have few solutions as they feel the big issue is to raise awareness. However the movement already is suggesting that we should be preparing for a major depression if not a 'collapse' of our cities and regions.

One of the key ideas being presented is that our cities will not only 'collapse' but will be dispersed and we will then create a more sustainable semi-rural lifestyle where we will all be responsible for a large proportion of our own food. This is seen to be in suburban agriculture, permaculture villages or hobby farms. It is a ruralisation of cities. Fundamental to this scenario is population decline as a quick calculation shows that the available land to enable small scale production would quickly disappear if all of our cities were pushed out onto agricultural land. The population in this scenario is reduced to 1 or 2 million in Australia and 1 or 2 billion in the world. The transition is never described but it would seem that the 'Killing Fields' would be a playground by comparison. It is however often discussed with some relish as the anti-population, anti-urban movements often link together to imagine a ruralised city as the preferred future. Peak oil is thus sometimes grabbed hold of with glee as the means to obtain a vision of the ruralised city.

In some ways this apocalyptic view which sees peak oil leading to a painful 'revolution' before leading to the dawn of a new rural age of harmony, is similar to a Marxist or communist view of history. Revolutionary collpase is seen as inevitable due to the laws of ecology and thermodynamics, and now the laws of oil depletion curves. These ideas need to be assessed as their currency grows daily under the frightening scenarios of peak oil.

Are cities going to 'collapse' due to peak oil and be replaced by some kind of ruralised city? Such issues challenge us to our core values. How then do we begin to approach such issues?

How do we think about 'Collapse'?

If oil depletion was just a technical matter then we could leave it to engineers and scientists with a bit of a 'hurry up'. We will of course need every assistance that engineers and scientists can provide, but the rhetoric around the issue suggests it is more than a technical issue. 'Collapse' is the language of apocalypse and we find such issues difficult to deal with in the academy and impossible to deal with in government. I feel it is important to at least think about how we should approach peak oil and its potential to cause collapse.

Philosophy can of course help as the issues contain ethical questions but they do challenge most of our assumptions; philosophers also drive cars and like all of us don't particularly want to be told their lifestyle may be threatened. The language of 'collapse' is largely confined to anthropology, ancient history and ecology or to theology. Urban

studies and planning address the issue of what kind of city may emerge, though it challenges each of these disciplines to see whether we are really in a fundamental shift to a new city form or not. I want to try and use these disciplines as I try to think about whether our cities and regions can address this deep challenge of oil depletion and what we are likely to see emerge.

Out of Eden

One of the most significant transitions in human history was from hunter-gatherer societies to agricultural-urban societies – the Neolithic revolution as it is known to science. This occurred sometime around 13,500 years ago in the Middle East when the Ice Age finished and certain grain crops began to be farmed rather than just gathered. Some animals began to be domesticated as well. The great significance for humanity and for the discussion here is that both techniques allowed settlements to be built around fertile river valleys. Cities are born out of agriculture and have a close synergy with the production systems in their bioregion.

Once people began to grow and graze what they wanted they could create a surplus in good times and store it. This released some people from the daily jobs of finding their own food and enabled them to manage settlements and create new technologies. A whole range of human opportunity was thus created. The processes of urban civilization were made possible when people left the 'garden' of nature and began creating human settlements.

Human history shows many hunter-gatherer societies existed across the world. They were, and still are in some cases, highly ingenious in taking from nature what they need to survive. The Neolithic Revolution in the Americas took off 7000 to 8000 years after the Middle East. However, without exception, whenever people have come into contact with a society that is settled, with agricultural surpluses and other technology of cities, they choose to come out of Eden. They never go back. Once they have tasted this new knowledge they are locked out of their innocent state.

In Box 1 this story of how we created an urban future is told from its historical and theological underpinnings, including how the ancients in our tradition saw the possibility of collapse in cities.

We do dream of more utopian pasts and try to help make them continue but history tells us that the process is one way. History, like that told by Jared Diamond, also shows that the cities we create from our knowledge can also collapse. From about 10,000 years ago, when the world became colder and drier again, many of these first Middle Eastern settlements did collapse and their ecological base was ruined. These societies then spread west and east from the Fertile Crescent, and as the climate warmed created the settlements and agricultural areas in Europe and Asia that we know today. Although cities have collapsed as they depleted their soils or were unable to manage their settlements or were destroyed by invaders, they did not go back to Eden. The broad sweep of history shows that cities tend to be rebuilt and have endured and grown.

In more recent times the world watched in amazement as the city of New Orleans collapsed due to an extreme climate event. The way that all civilizing constraints disappeared so quickly as people tried desperately to find food and safety shocked us all. History though suggests that we shouldn't be shocked – the potential is there in any city. However we do then tend to rebuild such cities and try to learn from the lessons.

The reason we rebuild and adapt cities is that our choices for returning to nature are very limited and to most people, are not acceptable. Not only do we not want to become totally dependent on foraging or hunting for our food, we mostly do not want the responsibility for food production at all. The attractions of doing other things that are only possible if we are freed from food production, drives us to cities. Thus history has also shown we are locked out of rural utopian visions which are set up to ensure that people create their own food rather than being in cities dependent on food. History is dotted with these experiments but those that succeed are usually either very short-lived or are heavily dependent on an urban area nearby. Locked out of Eden we seem destined to be more and more urban.

Box 1 **Cities: Historical and Theological Underpinnings.**
Cities grew out of the transition from hunter-gather to settled societies**.** The same change in history is described in a number of ancient stories about 'origins' including Judao-Christian stories in the Bible that have become a part of how we understand ourselves. The processes described in Genesis are told as a story because that is the way people communicated such deeper matters. But its depth of meaning has to be seen as depicting the fundamental shift described above. These ancient stories are important to understand if we are to address an issue like peak oil that many are claiming is a turning point in history. They help us in particular understand at a deeper level what is likely to happen to our cities following the ideas of western spiritual tradition.

Adam (meaning original man) and Eve are described as being in the Garden of Eden after a considerable process of creation that went on before that. In this garden all their needs are met and they remained in a state of innocence – without technology, totally dependent on nature. They chose however to eat the fruit from 'the tree of the knowledge of good and evil'. This is a deliberate choice with considerable historical implications – it seems to suggest that it changes human history from here on. People from then on must follow through on the knowledge they have and create their own futures rather than being in innocence where they had no need for this knowledge. They are as a consequence locked out of Eden.

There does seem to be evidence that human society is becoming more and more urban whilst at the same time our cities seem to be more and more precarious. But this tension is not new. Our urban civilization has always been a mixture of both trends. The ancients could see this and certainly the prophets in the Bible suggest this. Cities became the dwelling place of humanity but their potential to collapse could never be forgotten. The

prophets saw their role as reminding people of this possibility, even about the problem of resources running out:
'Though in their pride and arrogance they say,
The bricks are fallen but we will build in hewn stone,
The sycamores are hacked down,
But we will use cedars instead.' Isaiah 9:10.

But the city was not seen as fundamentally wrong so people were told not to 'leave Babylon' until it was about to collapse. Cities will always involve a choice to avoid this collapse. People will choose in cities to create more and more knowledge and more and more complex societies with more and more opportunity, but they will always be under the possibility of collapse. We need to accept that cities have a future but they always need to adapt or else they open themselves to the possibilities of collapsing. This tension between futures for a city is also the way that our western spiritual traditions saw the future.

The last book in the Bible pitches two scenarios of the future being two city-types which stand in tension. One is called Zion, the City of God, which is built by human science and craftsmanship (it is pictured as a city of jewels – which are of course human-made achievements) as well it is a city in harmony with nature (a tree of life and a river of life flow through the city). The other city is called Babylon, the City of Man (not the historical city of Babylon but any city that does what it did and collapsed); this city is full of frivolous consumption, repression of people and degradation of nature. This city is under judgement and it will collapse.

Some commentators like Bronowski (The Ascent of Man), see this urban process as a continually upward journey that brings more and more knowledge with all its potential to create a better world. Other commentators like Suzuki or Ehrlich or in Australia, Ted Trainer and Bill Mollison, see that this step took us on a downward journey where we began to lose contact with the earth, to pollute and degrade it, and to create bigger and bigger cities where people become just more and more alienated. The history outlined above suggests that both groups are likely to have some truth.

So, what of the future? There have been attempts in the past to ruralise cities. Pol Pot and Mao were two recent leaders who believed in a rural-oriented revolution that would replace our cities. But history shows that such rural idealisation of cities does not last and does little for rural production which soon collapsed under the weight of incompetent urban peasants. Cities rapidly rebuild after such experiments.

The idea that peak oil will disperse our cities into rural settlements or even rural suburbs, with only those surviving being those who can farm a small block, is not likely to be an outcome of peak oil, or any other scenario. We are going to have come to terms with a new kind of agriculture and a new kind of city, but we are not likely to reverse 13,000 years of urban history. Nor would we want to as all the evidence suggests that such small

rural holdings and garden suburbs on the fringes of our cities are the least sustainable parts of our cities in the age of peak oil and do nothing much for regional productivity. The wonders of science and all the best of human ingenuity and creativity will be needed to make our cities work, to come to grips with peak oil and our other problems – but it will still be an imaginable city, not a rural utopia - now we have come out of Eden. And our regions will still remain in synergy with our cities.

Human settlements and their regions remain vulnerable to nature and to the ability of their citizens to manage their futures using the knowledge that they have gathered. Scientific commentators as suggested are divided on where cities are going. They have either a view that sees an inevitable overcoming of all their problems as humans gather more and more knowledge. Or they see them as inevitably collapsing because they are fundamentally at odds with nature and human ability to live together. The oil peak has fed this predilection and should cause us to think seriously about our response.

The above analysis suggests:
1. Cities are our likely habitat for the foreseeable future.
2. We need to constantly adapt to ensure they are more sustainable: in their resources, in their ecological base and in their human livability.
3. They can collapse if we don't adapt.

I believe that peak oil poses a genuine challenge to our cities and their regions. However, this is not likely to mean a complete collapse of our urban society, nor should we contemplate such a process of deconstructing our cities, as at worst it will be a serious misdirection and at best it will be a distraction. We must adapt our cities and regions to this new challenge. We must take it seriously.

So what should we do?

1. **Take it seriously – education, crash demonstrations, research.**

Awareness of this issue needs to go through a similar process to the one that the world has adopted over climate change. Although Australia is seen as something of a laggard over climate change, a conservative administration did set up the Australian Greenhouse Office with several hundred staff, a budget for demonstrations, research and a serious commitment to educating the public. Global conferences of nations need to be established through the UN or other groupings like APEC, in order to set goals and begin sharing information on how the world economy can be weaned off oil. In WA in our State Sustainability Strategy there is a section on Oil Vulnerability, the Gas Transition and the Hydrogen Economy. This set out the peak oil issue and began a process of examining what it could mean. It was a major reason why the state backed a Hydrogen Fuel Cell Bus trial as it helped us to begin to work on these issues of transition away from oil. There is a long way to go and in all these issues it is important that Federal support and co-ordination with other states is built in from the start. Some of the ideas set out below need to be established as programs through an **Office of Oil Vulnerability.**

2. **Build cities with reduced car dependence.**

The world's cities existed and thrived before the age of oil; it is possible to imagine them transitioning to a future where oil is no longer needed.

Car dependence is the problem that drives oil vulnerability. I have spent the past thirty years gathering data with Jeff Kenworthy on cities and automobile dependence since I was first made aware of the oil issue in California. We have shown that US cities are the most vulnerable with annual consumption of around 56 GJ of fuel per person, Australian cities were next with around 34GJ, compared to European cities at 17GJ and Asian cities at 6 GJ per person. This huge variation is due to the density of the cities and their provision of viable alternatives in the form of public transport, walking and cycling – especially rail which seems to be the catalyst for a different kind of city.

The solution is a combination of transport infrastructure and land use policy as well as household education programs such as TravelSmart which have successfully reduced car use. This has been recognized by all Australian cities in their Metropolitan Strategies, all of which in recent years have developed policies to reduce car dependence. The major problems are not in the inner areas as these have similar fuel consumption per person to European cities, they are comparatively well off in terms of public transport infrastructure, and they are dense and mixed in their land use. However the newer suburbs in the outer areas, built in the past 4 or 5 decades, are heavily car dependent with fuel consumption similar to US cities. There are real equity issues here as the wealthy live mostly in inner areas and the poor increasingly are trapped on the fringe. Some households are using 40% of their income just to travel around to jobs and services. This will become intolerable after peak oil.

The first task therefore is to provide a crash program in public transport infrastructure for the middle and outer suburbs. Extensions of electric rail lines are the obvious way to go along with integrated local buses that can provide a service at least as quick as that provided by cars. Time savings will remain a bigger factor in determining mode of transport even under very high fuel costs.

The House of Representatives Report on Sustainable Cities which came out in 2005, recognizes all of these things and recommends that infrastructure funds (especially for rail) be provided for our cities, especially in the middle and outer suburbs. Most national governments do this, even US cities already do this, and we need to see that it becomes a critical shift in Federal policy in Australia. The money for such infrastructure is there in Canberra where substantial capital funds have now been accumulated. Also superannuation funds are ready to invest in our cities if a suitable mechanism can be found. Partnership funding of the required rail systems and integrated transport programs would follow if an **Urban Infrastructure Program** was begun. Perth's new rail system which has cost $2 billion and has given the city a 280 km modern electric rail system with 72 stations, was built without a cent of Federal funds, though the Freeway it passes down was funded almost entirely from Federal coffers. This railway has been justified over many elections as a way of oil-proofing the city. There are many new developments planned around its stations to take advantage of this insurance and its obvious amenity now, but there is much of Perth that remains highly vulnerable to peak oil.

We cannot afford to build further and further out in Australian cities. Most Australian city plans recognize that the main task is to redevelop in the present urban area,

especially in Transit Oriented Developments around rail lines. Cities need to be more urban and the countryside more rural. However there are many still who believe cities should be dispersed into rural areas as outlined above. Getting serious about oil depletion means that rural lifestyles on the edge of the city cannot be facilitated and subsidized as they have been. There is a real clash between those who want to ruralise cities and those who realize the problems this creates in car dependence.

This does not mean that we do not try to create local eco-villages where people in cities can be more reliant on each other with reduced oil consumption as a result. Such places, like Christie Place in Adelaide, are essential to help us through this transition. But if they are an excuse to extend the city into areas that are better left rural, then they are not going to help.

3. **Build regions with reduced oil-dependence.**

The regions of Australia, outside our cities, have each been growing in their productivity based on cheap oil. Each region should now examine what it will mean for them if there is less oil each year from now on. In WA we have just completed our first Regional Sustainability Strategy in the Pilbara. The Strategy suggests that the Pilbara should become a demonstration region for how to become 'diesel free'. The Pilbara is well set up for this as it is in a period of growth where considerable investment is coming to the area thus enabling new things to be tried. And it has substantial resources of natural gas which it seems is the best short term transition fuel to replace oil. Yet all the big trucks, mining equipment and rail systems are powered by diesel and even power stations are mostly fuelled by diesel – largely imported from the Middle East. Technology exists for all of these systems to be transferred to run on local gas. A major partnership program should establish this demonstration and then create a large experiment to demonstrate how to convert the world's highest solar insolation rate into electricity to electrolyse water into hydrogen, eventually feeding this into the pipelines and liquefaction plants that are there. A bold vision for the Pilbara can demonstrate that there is a long term future for the region from which so much of the wealth of the country is derived. It can turn an Achilles heel issue for the Pilbara into a source of hope for the world.

Each natural resource management region in Australia has in recent years been studied in great depth for the way in which agriculture, conservation and water management can be better integrated. They have been established with a governance system and a set of grants to begin implementing this NRM. None of these regions appears to have studied what are likely to be the implications if they have to face rapidly rising prices for diesel.

4. **Rebuild agriculture.**

A lot of the literature on peak oil suggests that the biggest impact is going to be on agriculture. Certainly agriculture has become very dependent on diesel. In the analysis above I have tried to show that I do not expect our cities to begin taking over from rural producers in the production of food and fibre. In fact the loss of good agricultural soils to fringe urban suburbs and hobby farms has to stop as they are generally very unproductive as well as being highly car dependent. In the analysis above on Australian cities the fringe urban areas like the Central Coast in Sydney and Mornington Peninsular in Melbourne, are 3 to 4 times the average fuel consumption per person and 8 times that of

the inner city. If we are serious about oil depletion and sustainability in general we need to ensure that the countryside is more rural as well as the city being more urban.

One of the ways we can do this in Australian cities is to establish **Horticultural Precincts** immediately adjacent to our cities. These areas need to set aside the good soils and ensure they are retained in perpetuity for horticulture rather than always being seen as 'market garden superannuation' for the next suburb. In these areas we can then get serious about recycling wastewater as Water Corporations cannot invest in the pipes and technology for this unless they have certainty about the future for the area.

Agriculture will need to adapt by growing its own biodiesel, using gas and switching to more efficient rail transport rather than trucks. This transition will need assistance and subsidized diesel is not helping. A crash program in diesel phase-out could change agricultural oil vulnerability in a five year period.

One of the obvious ways that agriculture will need to change is to become more localized. When a flash flood cut the Nullabor a year ago there were trucks caught on either side and some food deteriorated, including a truck load of tomatoes on one side and a truck load of tomatoes on the other side. Such silliness will fall away when transport costs become significant in food distribution. There may be a reduction in choice as regional produce will be favoured over imported produce but this can be part of regional identity and the slow food movement, rather than deprivation. Do we really need to import vegetables from China – by plane? Wheat however is a bulk commodity which can be transported by train and ship at low oil or no oil cost. Agriculture needs to be more localized as well as creating surpluses which are traded for the benefit of regional and urban opportunity.

5. **Facilitate localism.**

James H Kunstler in the Long Emergency says that in response to peak oil 'Our lives will become profoundly and intensely local.' Localism is the required modus operandi for the post oil peak world, just as globalism was for the cheap oil era. Globalization of the economy began with the first cities that began to trade beyond their immediate region – probably 4000 years ago – and it will continue under a post peak oil world. But its character will alter as the extent of trade and movement cannot be expected to continue as though its costs were unimportant. As mentioned above there are social movements that are beginning to push us more towards localism anyway: the need for local identity and sense of place; the slow food movement and its base in local foods; the ecocity movement with its desire to enable local community to be the basis managing local resources and local infrastructure.

The value of the internet and video conference facilities on our phones will become even more obvious to maintain the global interaction that we have tasted and will not easily give up. But in the same way that governments have facilitated businesses to export globally and have pushed international tourism, we now need to facilitate localism. I would suggest we need an **Office of Localism** with a program to fund innovations in localism. This can help to fund demonstrations: where there is a need to create industrial ecology of businesses that can share their wastes as resources or work together to ensure

local resources are used and re-used; where local food linkages need to be linked up between peri-urban growers and urban communities to take direct supply of whatever is fresh; where local enterprises can be facilitated based on local resources and talents; where local tourism can be marketed to local people…

6. Regulate for the post-oil transition.

A systematic review of regulations will show that at present we subsidize oil consumption, whether it be through the diesel rebate, the fringe benefits tax and salary packaging rules on cars and fuel, the subsidy on land development at the urban fringe (around $40,000 per block in most Australian cities), as well as the subsidy given to road users in the form of road building grants. Proactive regulation is also required to phase out the excessive use of four wheel drives and other gas guzzling cars with a clear phase-in program for gas-based electric hybrid cars. Lester Brown, through his Worldwatch Institute and now his Earth Institute, is one of the few broad commentators who have caught hold of the peak oil issue, but can still give a relatively optimistic view, suggests:

> *'For the U.S. automotive fuel economy, the key to greatly reducing oil use and carbon emissions is gas-electric hybrid cars. The average new car sold in the United States last year got 22 miles to the gallon, compared with 55 miles per gallon for the Toyota Prius. If the United States decided for oil security and climate stabilization reasons to replace its entire fleet of passenger vehicles with super-efficient gas-electric hybrids over the next 10 years, gasoline use could easily be cut in half. This would involve no change in the number of cars or miles driven, only a shift to the most efficient automotive propulsion technology now available.*
>
> *Beyond this, a gas-electric hybrid with an additional storage battery and a plug-in capacity would allow us to use electricity for short distance driving, such as the daily commute or grocery shopping. This could cut U.S. gasoline use by an additional 20 percent, for a total reduction of 70 percent. Then if we invest in thousands of wind farms across the country to feed cheap electricity into the grid, we could do most short-distance driving with wind energy, dramatically reducing both carbon emissions and the pressure on world oil supplies.*
>
> *Using timers to recharge batteries with electricity coming from wind farms during the low demand hours between 1 and 6 a.m. costs the equivalent of 50¢-a-gallon gasoline. We have not only an inexhaustible alternative to dwindling reserves of oil, but an incredibly cheap one.'*

The same potential to switch to lower fuel consuming vehicles has been there for 20 years. The market was going to look after this ('trust us' the motor vehicle manufacturers said) but instead we got four wheel drives for the trip to the supermarket and a reversal of the gain in fuel efficiency caused by the regulations of the 1970's. This cannot be allowed again – we must regulate for motor vehicles to transition away from oil. Governments can begin by regulating for their own fleets.

Aviation is a special case. There seems no alternative to oil on the horizon. The only solution it seems will be to allow gradual price increases to reduce unnecessary travel, to

switch to fast trains for medium distance journeys, and to do more and more by internet conferencing (including family events). However, it would seem there would be a case to ensure that aviation had some priority on remaining fuel – this would also require some kind of regulation.

7. **Prepare risk management scenarios for the future.**

Australia, and probably most advanced countries, have developed highly complex scenarios for dealing with terrorism. There are no such scenarios for dealing with oil vulnerability. We must get all our strategic analysts to take oil depletion seriously and see what must be done in short, medium and long term scenarios for reductions in oil supplies. The start of a process was there with the development of thinking about the Hydrogen Economy but this was only long term. We need to see how we can reach the future where there is no oil in a series of steps similar to the thoughts of Lester Brown above. We cannot afford to depend on the market to handle this as it will always see that cheap supplies of oil from the Middle East are the only thing we need to worry about and while they are expanding, we are not in trouble. They are not and we cannot any longer just hope that they will continue to grow again. A new world is emerging where we must be much more clever or our vulnerability to oil in both cities and regions will be exposed.

Conclusions

Peak oil is a critical issue that demands our attention. It cannot be left to short term market interests as it requires long term perspectives that can help in the transition away from oil. Long term issues that challenge us with the prospect of collapse bring out deeper fears and beliefs. Peak oil has its share of those who see the collapse of our cities and regions and the emergence of a more ruralised city, associated with large scale population decline. This paper suggests that there is little historical precedent for a ruralised city nor would it be preferred, especially from a perspective of peak oil. Our cities and regions do indeed need to adapt if they are going to avoid the collapse potential of peak oil. But in order to do this our cities need to become more urban, and our countryside more rural – not vice versa. Suggestions are made for programs in our cities and regions that enable us to begin the necessary adaptations to a world with less and less oil.

References

Campbell CJ (1991) **The Golden Age of Oil, 1950-2050: the depletion of a resource.** Kluwer, Dordrecht.

Diamond J (2005) **Collapse: How Societies Choose to Fail or Succeed.** Viking Books, New York.

Deffeyes K S (2005) **Beyond Oil : The View from Hubbert's Peak**, Hill and Wang, New York.

Hirsch, R.L., Bezdek, R.H, Wendling, R.M. (2005) **Peaking of World Oil Production: Impacts, Mitigation and Risk Management.** DOE NETL. February.

House of Representatives (2005) **Sustainable Cities,** Parliament House, Canberra.

Hubbert, M. King (1956) ‘Nuclear Energy and the Fossil Fuels’. Presented before the Spring Meeting of the Southern District, American Petroleum Institute, Plaza Hotel, San Antonio, Texas, March 7-8-9, 1956.

Kunstler J Howard (2005) **The Long Emergency: Surviving the End of the Oil Age, Climate Change, and Other Converging Catastrophes of the Twenty-first Century,** Atlantic Monthly Press, New York.

Lankshear D and Cameron N (2005) Peak Oil: A Christian Response, **Zadok Perspectives**, 88: 9-11.

Newman P and Kenworthy J (1999) **Sustainability and Cities: Overcoming Automobile Dependence,** Island Press, Washington DC.

Simmons R (2005) **Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy,** Wiley, New Jersey.

WA Government (2003) **State Sustainability Strategy**, Department of the Premier and Cabinet, Perth.